



March 4, 2014

Mr. Dwight Leisle
Port of Portland
7200 NE Airport Way
Portland, Oregon 97218

Re: Incremental Surface Soil Sampling Results
Willamette Cove Upland Facility
Portland, Oregon
ECSI No. 271
1056-03

Dear Mr. Leisle:

This letter presents the results of incremental soil sampling activities completed for the Willamette Cove Upland Facility (the Facility; Figures 1 and 2) in the St. Johns area of Portland, Oregon. The sampling activities were conducted to support the preparation of the Feasibility Study (FS). Work at the Facility is being conducted under Voluntary Agreement EC-NWR-00-26 between the Port of Portland (Port), Metro, and the Oregon Department of Environmental Quality (DEQ). The sampling activities were completed in accordance with the DEQ-approved scope presented in the *Revisions to Proposed Incremental Surface Soil Sampling* letter (Apex Companies, LLC [Apex], 2013). The methods, procedures, and results of the chemical analyses are presented in this letter.

SAMPLING ACTIVITIES

Preparatory Activities

The following activities and schedule coordination were completed in preparation for the field work.

- **Health and Safety Plan (HASP).** Apex Companies, LLC (Apex) updated the HASP for its personnel involved with the project.
- **Coordination of Facility Access.** The work activities were conducted in coordination with Metro.

Surface Soil Sampling

The following protocol was prepared based on the *ITRC Technical and Regulatory Guidance Incremental Sampling Methodology* (dated February 2012).

Surface soil samples were collected from four decision unit areas (DU-4 through DU-7) using an incremental sampling technique (Figure 3). Consistent with the historical incremental sampling, the lower margin of the decision units was located at the approximate Mean High Water Line. Each incremental sample consisted of 42 to 50 soil increments collected from a randomly selected quadrant as shown on the grids presented on Figure 3. The sample locations within each decision unit were established using a high-accuracy, handheld global positioning system (GPS) device (Trimble® GeoXH™). At locations that were not sampleable (e.g., due to the presence of armor rock, steep vegetated slopes, etc.) the sample location was moved to a different randomly selected quadrant within the grid, as necessary. Two grids within DU-5 were not sampled due to the presence of asphalt-concrete. Eight grids within DU-4 were not sampled due to the presence of Portland cement concrete.

The soil increments were collected from the top 6 inches of surface soil after removing vegetation. The soil increments were collected with a 0.5 inch diameter cylindrical stainless steel sampler with the exception of thirteen locations where multiple attempts with the cylindrical sampler were unsuccessful (e.g., due to the presence of gravel). In those locations a six-inch deep hole was initially excavated with hand tools (e.g., shovel). An approximate 30-gram increment was collected from the sidewall of the hole using a sampling spoon and added to the sampling container for the decision unit. A replicate sample was collected from DU-5. The replicate increment locations were collected 10 feet east of the primary location.

Non-disposable items (e.g., hand trowels, spoons, etc.) were cleaned by washing in a detergent (Alconox®) solution, rinsing with tap water, followed with a deionized water rinse prior to initiating sampling and between sampling for each decision unit.

CHEMICAL ANALYSES

The soil samples were submitted to Vista Analytical (Vista) of El Dorado Hills, California for chemical analyses on a normal turnaround basis for the following:

- Dioxins/furans by EPA Method 8290;
- Priority Pollutant 13 metals by EPA 6000/7000 series methods; and
- Polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270-SIM.

The requested method reporting limits (MRLs) were consistent with the historical laboratory analyses and the concentrations were presented to the method detection limit (MDL). The laboratory analyses for metals and PAHs were subcontracted by Vista to Specialty Analytical in Clackamas, Oregon. The results are listed in Table 1 along with relevant regulatory screening levels and calculated Preliminary Remediation Goals (PRGs).

The total mass received by the laboratory (after air drying) ranged from approximately 1,100 to 1,400 kilograms. No sample grinding or milling was completed. In order to reduce the fundamental error the subsample size was increased to 30 grams for dioxins/furans and PAHs. For metals, the laboratory increased the sample size to 10 grams by digesting five 2-gram aliquots and then obtaining a sub-aliquot from each digestion to obtain the volume of extract needed for the analysis.

One laboratory process replicate was collected from the two dimensional slabcake prepared by the laboratory (along with the percent moisture analysis).

The laboratory analytical reports (in CD-Rom format due to the length of the Level III deliverable reports) are provided in Attachment A along with a data quality review.

DATA EVALUATION AND CONCLUSIONS

In Table 1, the incremental sample results are compared to various screening levels, summarized as follows.

- Human health screening:
 - One to three PAHs exceeded the Recreational Trespasser/Park User PRG in each decision unit;
 - For the East and West Parcels (DU-4 and DU-7, respectively), three dioxin/furan congeners exceeded Recreational Trespasser/Park User PRGs by factors of up to 1.6 (East) and 3.4 (West).
 - For the east Central Parcel (DU-5), four dioxin/furan congeners exceeded Recreational Trespasser/Park User PRGs by factors of up to 4.3.
 - For the west Central Parcel (DU-6), nine dioxin/furan congeners exceeded Recreational Trespasser/Park User PRGs by factors of 1.1 to 160. Four congeners exceeded the construction worker PRGs (by factors of 1.4 to 16) and three congeners exceeded the transient trespasser PRGs (by factors of 3.3 to 8.7). In addition, two congeners were present at concentrations that exceed the high-concentration hot spot level.
- Ecological screening:
 - For the West Parcel (DU-7), two metals and four dioxin/furan congeners exceeded ecological PRGs. Copper and mercury exceeded PRGs by factors of less than 1.5. Dioxin/furan congeners exceeded PRGs by factors of 2 to 12, with one congener above the high-concentration hot spot level.
 - For the East Parcel (DU-4), three metals and five dioxin/furan congeners exceeded ecological PRGs. Antimony, lead, and zinc exceeded PRGs by factors of less than 1.7. Dioxin/furan congeners exceeded PRGs by factors of 1.2 to 6.
 - For the east Central Parcel (DU-5), four metals and nine dioxin/furan congeners exceeded ecological PRGs. Copper, lead, and zinc exceeded PRGs by factors of 1.2 to 4. Mercury exceeded the PRG by a factor of 26. Dioxin/furan congeners exceeded PRGs by factors of 1.2 to 12. Mercury and two dioxin/furan congeners exceeded high-concentration hot spot levels.
 - For the west Central Parcel (DU-6), three metals and 11 dioxin/furan congeners exceeded ecological PRGs. Copper and lead exceeded PRGs by factors of 5.8 and 1.4. Mercury exceeded the PRG by a factor of 37. Dioxin/furan congeners exceeded PRGs by factors of 2 to 580. Mercury and seven dioxin/furan congeners exceeded high-concentration hot spot levels.

In Table 2, the incremental sample results for metals and PAHs are compared to exposure point concentrations (EPCs) calculated in the human health and ecological risk assessments (for Contaminants of Potential Concern [COPCs] only). Except for mercury in the Central Parcel, the concentrations detected in the incremental samples are lower than the risk assessment exposure point concentrations. From this, it is concluded that, except for mercury in the Central Parcel, the baseline risk conclusions for metals and PAHs are supported by the incremental sample results.

Because of a lack of data, the baseline risk assessment did not calculate risks from dioxins/furans for the West, Central, or East Parcels. Based on the screening in Table 1, the following risk conclusions are identified for dioxins/furans.

- Except for the west Central Parcel (DU-6), dioxins/furans are relatively uniformly present with the toxic equivalent (TEQ) concentration ranging from approximately 60 to 160 ng/kg. Corresponding human health risks are on the order of two to four times the acceptable risk level for the Recreational Trespasser/Park User. For ecological receptors, the acceptable risk level is exceeded by up to 12 times for individual congeners and 20 to 50 times for TEQ concentrations.
- On the west Central Parcel (DU-6), dioxins/furans were detected at concentrations of 20 to 70 times (TEQ) the concentrations detected in DU-4 through DU-7 and 5 to 40 times the wharf road incremental samples (DU-1 through DU-3). These results suggest that a dioxin hot spot is present on DU-6.

The incremental sampling results are consistent with the risk model and hot spot evaluation used for the feasibility study with the following exceptions:

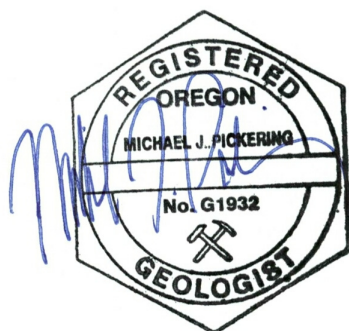
- Dioxins/furans are Contaminants of Concern (COCs) in the West, Central, and East Parcels;
- Unacceptable ecological risks are present outside of hot spots in the West (DU-7) and East (DU-4) Parcels;
- Hot spots of mercury may not be fully defined on the Central Parcel (DU-5 and DU-6);
- Hot spots of dioxins/furans are present on the west Central Parcel (DU-6); and
- Hot spot levels of one or two dioxin/furan congeners are present on the West (DU-4) and east Central (DU-5) Parcels.

Based on these results, the following is recommended.

- Conduct additional surface soil sampling on the Central Parcel (DU-5 and DU-6) to better define mercury hot spots. This was proposed as part of the surface soil sampling completed to support the Remedial Design (Apex, 2014).
- Conduct additional surface soil sampling on DU-6 to better define dioxins/furans hot spots. A Work Plan will be prepared presenting the proposed approach.
- Update the feasibility study to accommodate the expanded ecological baseline risk and additional identified hot spots.

If you have any questions regarding these activities, please contact the undersigned at (503) 924-4704.

Sincerely,



expires 12/31/2014

Michael J. Pickering, R.G.
Senior Associate Hydrogeologist

Herbert F. Clough, P.E.
Principal

REFERENCES

- Apex, 2013. Revisions to Proposed Incremental Surface Soil Sampling, Willamette Cove Upland Facility Portland, Oregon. December 30, 2013.
- Apex, 2014. Proposed Surface Soil Sampling – Remedial Design, Willamette Cove Upland Facility Portland, Oregon. March 3, 2014.
- DEQ/EPA, 2005. Portland Harbor Joint Source Control Strategy – Final (Table 3-1 Updated July 16, 2007). December 2005.

ATTACHMENTS

Table 1 – Incremental Sample Results

Table 2 – Incremental Sample Results Compared with Risk Assessment COPC Exposure Point Concentrations

Figure 1 – Facility Location Map

Figure 2 – Upland Facility Map

Figure 3 – Sampling Plan

Attachment A – Laboratory Analytical Reports (CD-ROM) and Data Quality Review

Table 1 - Incremental Sample Results
Willamette Cove Upland Facility
Portland, Oregon

Willamette Cove Upland Facility Portland, Oregon															EAST PARCEL	CENTRAL EAST PARCEL			CENTRAL WEST PARCEL	WEST PARCEL	
			Human Health PRGs - Direct Contact					Surface Sample Locations on Riverbank				2012 Incremental Samples				2014 Incremental Samples					
PRIMARY SAMPLE	JSCS SLVs	Metals Background	Transient Trespasser	Construction Worker	Recreational Trespasser	Eco PRGs	Beach Wharf Beach-1	WC-1/2/3	WC-1 Surface	WC-2 Surface	WC-3 Surface	DU-1	DU-1R	DU-2	DU-3	DU-4	DU-5	DU-5 (lab dupe)	DU-5R	DU-6	DU-7
DISCRETE SAMPLES																					
Date Sampled							9/27/2010	10/1/2010	10/1/2010	10/1/2010	10/1/2010	8/9/2012	8/9/2012	8/8/2012	8/13/2012	1/13/2014	1/13/2014	1/13/2014	1/13/2014	1/13/2014	1/13/2014
Sample Interval (inches)							12-18	3-10	4-10	3-9	3-9	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6
TPH-HCID (mg/kg)																					
Diesel Range	--	--	--	--	--	--	DET	72.1	--	--	--	--	--	--	--	--	--	--	--	--	--
Gasoline Range	--	--	--	--	--	--	ND	<20.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil Range	--	--	--	--	--	--	DET	738	--	--	--	--	--	--	--	--	--	--	--	--	--
NWTPH-Gx (mg/kg)																					
Gasoline Range Organics	--	--	--	--	--	--	1.4 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NWTPH-Dx Silica Gel Cleanup (mg/kg)																					
Diesel Range	--	--	--	--	--	--	397	72.3	--	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil Range	--	--	--	--	--	--	199	388	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (EPA 6000/7000 Series Methods; mg/kg)																					
Antimony	64	0.56	--	41.3	32.7	2.7	0.57 J	4.9	6.9	7.2	2.5	--	--	--	--	2.89	1.29	1.31	1.48	<0.510	<0.519
Arsenic	7	8.8	--	--	8.8	--	39	8.6	24.8	11.9	7.3	--	--	--	--	3.67	6.02	8.03	7.41	4.95	4.52
Beryllium	--	2	--	--	--	--	0.45	0.19	0.31	0.38	0.28	--	--	--	--	0.716	0.679	0.707	0.685	0.678	1.09
Cadmium	1	0.63	--	--	--	--	1	1.7	0.37	0.49	0.88	--	--	--	--	0.368	0.500	0.553	0.569	0.37	0.337
Chromium	111	76	--	--	--	76	33.4	42.3	62.1	48.8	31.7	--	--	--	--	11.4	16.1	18.3	14.9	11.7	19.2
Copper	149	34	--	--	9,510	70	1,400	251	262	188	195	--	--	--	--	65.1	293	271	196	404	102
Lead	17	79	--	614	950	120	8,660	693	889	770	727	--	--	--	--	201	310	304	271	164	43.0
Nickel	49	47	--	--	--	47.3	25	28.4	54.5	43.1	49.1	--	--	--	--	13.9	16.6	18.3	17.4	14.7	15.4
Selenium	2	0.71	--	--	--	--	1	0.75	0.20 J,BU	0.21 J,BU	0.13 J,BU	--	--	--	--	<0.0508	<0.0508	<0.0508	<0.0508	<0.0510	<0.0519
Silver	5	0.82	--	--	--	--	0.18 J,BU	0.44 J,BU	0.6 BU	0.40 J,BU	0.35 J,BU	--	--	--	--	<0.254	<0.254	<0.254	<0.254	<0.255	<0.260
Thallium	--	5.2	--	--	--	--	0.080 J	0.24	0.070 J	0.077 J	0.056 J	--	--	--	--	<0.635	<0.635	<0.635	<0.635	<0.637	<0.649
Zinc	459	180	--	--	--	201	684	548	451	383	410	--	--	--	--	221	238	250	197	187	151
Mercury	0.07	0.23	--	--	--	0.3	113	5.5	8.1	1.7	1.4 H1	--	--	--	--	0.0541 HT	7.00 HT	7.86 HT	6.58 HT	11.0 HT	0.359 HT
PAHs (EPA 8270 SIM; ug/kg)																					
1-Methylnaphthalene	--	--	--	--	--	--	40	15.3	--	--	--	--	--	--	--	<6.77	7.17	7.77	11.0	12.3	<6.93
2-Methylnaphthalene	200	--	--	--	--	--	79	35	--	--	--	--	--	--	--	7.51	17.2	16.1	31.9	27.7	7.86
Acenaphthene	300	--	--	--	--	--	13	7.5	--	--	--	--	--	--	--	<6.77	9.79	10.2	8.94	15.1	16.4
Acenaphthylene	200	--	--	--	--	--	51	19.4	--	--	--	--	--	--	--	32.7	42.0	41.8	45.6	113	18.9
Anthracene	845	--	--	--	--	--	34	27.3	--	--	--	--	--	--	--	23.8	56.9	55.0	62.4	103	38.7
Benzo(a)anthracene	1,050	--	38,800	21,400	497	--	103	82.1	--	--	--	--	--	--	--	93.8	162	163	152	400	187
Benzo(a)pyrene	1,450	--	3,880	2,140	49.7	--	78	121	--	--	--	--	--	--	--	219	288	294	253	660	313
Benzo(b)fluoranthene	--	--	38,800	21,400	497	--	123 1n(a)	155	--	--	--	--	--	--	--	195	361	326	275	648	265
Benzo(g,h,i)perylene	300	--	--	--	--	--	30	90.8	--	--	--	--	--	--	--	156	255	249	262	716	238
Benzo(k)fluoranthene	13,000	--	--	--	--	--	110 1n(a)	94.6	--	--	--	--	--	--	--	165	313	324	331	521	252
Chrysene	1,290	--	--	--	--	--	146	116	--	--	--	--	--	--	--	192	292	286	268	592	255
Dibenz(a,h)anthracene	1,300	--	3,880	2,140	49.7	--	13	34.6	--	--	--	--	--	--	--	41.4	66.7	65.0	41.7	224	66.9
Fluoranthene	2,230	--	--	--	--	--	315	152	--	--	--	--	--	--	--	238	530	562	483	730	508
Fluorene	536	--	--	--	--	--	30	9.5	--	--	--	--	--	--	--	<6.77	<6.77	<6.77	<6.77	7.47	13.6
Indeno(1,2,3-cd)pyrene	100	--	--	--	--	--	30	78.6	--	--	--	--	--	--	--	119	172	168	175	623	148
Naphthalene	561	--	--	--	--	--	203	75.2	--	--	--	--	--	--	--	9.86	19.8	22.0	25.9	36.0	10.1
Phenanthrene	1,170	--	--	--	--	--	187	104	--	--	--	--	--	--	--	80.1	136	142	124	292	141
Pyrene	1,520	--	--	--	--	--	256	139	--	--	--	--	--	--	--	151	278	282	229	579	260
BapEq	--	--	3,880	2,140	49.7	--	111	189	--	--	--	--	--	--	--	305	430	431	316	1,064	445
HPAHs	--	--	--	--	--	5,600	1,203	1,064	--	--	--	--	--	--	--	1,570	2,718	2,719	2,470	5,693	2,493

See notes on last page.

Table 1 - Incremental Sample Results
Willamette Cove Upland Facility
Portland, Oregon

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			Human Health PRGs - Direct Contact					Surface Sample Locations on Riverbank				2012 Incremental Samples				2014 Incremental Samples						
PRIMARY SAMPLE	JSCS SLVs	Metals Background	Transient Trespasser	Construction Worker	Recreational Trespasser	Eco PRGs	Beach Wharf Beach-1	WC-1/2/3		WC-1 Surface	WC-2 Surface	WC-3 Surface	DU-1	DU-1R	DU-2	DU-3	DU-4	DU-5	DU-5 (lab dupe)	DU-5R	DU-6	DU-7
DISCRETE SAMPLES																						
Date Sampled							9/27/2010	10/1/2010	10/1/2010	10/1/2010	10/1/2010	10/1/2010	8/9/2012	8/9/2012	8/8/2012	8/13/2012	1/13/2014	1/13/2014	1/13/2014	1/13/2014	1/13/2014	1/13/2014
Sample Interval (inches)							12-18	3-10	4-10	3-9	3-9	3-9	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6
Dioxins/Furans (EPA 8290; ng/kg)																						
2,3,7,8-TCDF	0.77	--	2,080	1,150	113	31	0.5 J	5.0	<5.3 P	<3.8 P	<1.6 P	13.4	10.8	37.3	16.2	4.04	5.91	6.44	5.64	3.03	5.45	
2,3,7,8-TCDD	0.0091	--	208	115	11.3	3.1	<0.4	1.0 J	<1.9 I	4.5 J	24	6.30	4.65	6.45	2.58	1.08	2.92	3.66	2.23	56.2	2.11	
1,2,3,4,6,7,8-HpCDD	690	--	20,800	11,500	1,130	310	2.5 J	3,100	2,000	1,200	2,400	3,160 E	1,540 E	2,550 E	1,530 E	1,810 E	2,960 E	3,050 E	1,560 E	16,200 E	672	
1,2,3,4,6,7,8-HpCDF	690	--	20,800	11,500	1,130	310	2.5 J	250	430	210	2,300	387	231	449	235	171	273 P	281	190 P	5,040 E	172	
1,2,3,4,7,8,9-HpCDF	690	--	20,800	11,500	1,130	310	<0.58	16	52	19 J	340	23.2	15.7	73.8	21.2	11.6	15.7	16.1	11.5	73.6	6.74	
1,2,3,4,7,8-HxCDD	--	--	2,080	1,150	113	31	<0.55	15	42 J	25 J	150	53	25.4	43.9	20.3	16	37.3	38	19.9	547	13.4	
1,2,3,4,7,8-HxCDF	2.7	--	2,080	1,150	113	31	1.4 J	22	220	43 J	1,400	46.8	33.3	255	51.3	17.7	29.4	28.7	23.1	84.9	18.9	
1,2,3,6,7,8-HxCDD	--	--	2,080	1,150	113	31	0.51 J	150	150	110	680	659	137	282	118	116	358	343	170	13,000 E	285	
1,2,3,6,7,8-HxCDF	2.7	--	2,080	1,150	113	31	2.2 J	13	<4.6 P	<2.2 P	<12 P	42.4	32.2	280	81.9	11.2	28.3 P	25.2 P	25.5 P	119	8.47	
1,2,3,7,8,9-HxCDD	--	--	2,080	1,150	113	31	<0.49	29	90	65	430	333	72.8	123	64.2	43.9	133	178	88.8	6,940 E	170	
1,2,3,7,8,9-HxCDF	2.7	--	--	--	--	31	0.96 J	14	120	20 J	1,000	<0.408	<0.347	<0.835	<0.494	5.74	2.21	3.00	3.84	13.4	1.18	
2,3,4,6,7,8-HxCDF	2.7	--	2,080	1,150	113	31	3.1 J	13	310	58	3,200	74.2	57.3	652	214	19.6	51.2	49.3	47.5	133	7.4	
1,2,3,7,8-PeCDD	2.6	--	208	115	11.3	3.1	<0.54	8.5	35 J	18 J	240	67.4	25.0	84.8	21.5	11.4	41.4	48.7	27.4	1,810 E	38.6	
1,2,3,7,8-PeCDF	2.6	--	6,930	3,850	375	103	<0.61	5.8	<5.7 P	<2.8 P	<11 P	18.3	13.2	45.6	15.6	5.15	8.54	8.89	6.84	13.1	8.02	
2,3,4,7,8-PeCDF	0.03	--	693	385	37.5	10.3	<0.42	8.3	1,500	180	16,000	72.4	65.2	1,590 E	510	4.97	16.8	29.2	14	19.8	4.92	
OCDF	23,000	--	693,000	385,000	37,500	10,300	2.9 J	490	630	240	460	331	295	310	366	279	452	482	413	2,290 E	219	
OCDD	23,000	--	693,000	385,000	37,500	10,300	8.5 J	27,000	13,000	7,500	10,000	18,300 E	10,300 E	18,800 E	10,000 E	12,200 E	18,900 E	19,900 E	9,650 E	8,010 E	2,860 E	
Total TCDF	--	--	--	--	--	--	12	79	3,500	610	16,000 E	455 P	401 P	4,980 P	1,490 P	57.1 P	507	364 P	677 P	106 P	30.2 P	
Total TCDD	--	--	--	--	--	--	<0.4	35	160	84	890	102	80.4	244	73.5	15.9	47.3	61.3	39	768	23.6	
Total PeCDF	--	--	--	--	--	--	34	140	16,000	2,200	150,000 E	964 P	878	22,000 P	6,800 P	153 P	1,000	854 P	1,130 P	437 P	71.5 P	
Total PeCDD	--	--	--	--	--	--	<0.54	53	510	200	3,700	574	255	1,150	215	62	297	351	197	9,960	243	
Total HxCDF	--	--	--	--	--	--	20	570	8,500	1,400	93,000 E	915 P	698	8,920 P	2,970 P	461 P	973	948 P	773 P	2,700 P	169 P	
Total HxCDD	--	--	--	--	--	--	4.5 J	600	1,300	920	7,300	4,340	1,040	2,300	831	540	1,990	2,310	1,130	74,800	1,970	
Total HpCDF	--	--	--	--	--	--	4.6 J	800	1,300	500	6,300	798	530	1,140	689	530	874	914	585 P	8,880 P	390	
Total HpCDD	--	--	--	--	--	--	4.9	6,000	3,900	2,600	5,000	6,920	3,280	4,620	2,740	3,230	6,070	6,160	3,090	33,800	1,460	
TEQ	--	--	208	115	11.3	3.1	1.5	80	600	130	5,700	259	108	773	255	61.2	152	168	93.1	4,170	103	
Butyl Tins (Krones Method; ug/kg)																						
Tributyltin	2.3	--	--	--	--	--	<37	<36	--	--	--	--	--	--	--	--	--	--	--	--	--	
Dibutyltin	--	--	--	--	--	--	<56	<53	--	--	--	--	--	--	--	--	--	--	--	--	--	
Butyltin	--	--	--	--	--	--	<39	<38	--	--	--	--	--	--	--	--	--	--	--	--	--	

Notes:

1. µg/kg (ppb) = micrograms per kilogram (parts per billion)

2. mg/kg (ppm) = milligrams per kilogram (parts per million)

3. < = Not detected above the method reporting limit (MRL)

4. JSCS = Screening levels from Portland Harbor Joint Source Control Strategy – Final (Table 3-1 Updated July 16, 2007). December 2005.

5. 1n(a) = Reported as total Benzo(b,k)fluoranthene: result may be biased high.

6. P = The amount reported is the maximum possible concentration due to possible chlorinated diphenylether interference.

7. BU = Analyte was detected in associated method blank above the reporting limit. Sample concentrations were less than 5 times the concentration detected in the method blank and consequently the sample results are considered non-detect.

8. J = Estimated.

9. E = Above the High Calibration Limit.

10. HT = Sample was analyzed outside recommended holding time at client request.
11. Metals Background = DEQ Development of Oregon Background Metals Concentrations in Soil. Technical Report. Land Quality Division Cleanup Program. March 2013 - Portland Basin

12. PRGs = Preliminary Remediation Goals for human health and ecological receptors (lowest available) from site-specific risk assessment calculations.

13. Shading denotes exceedence of metals background (metals only) and JSCS SLV (riverbank samples only).

14. **Bold** denotes exceedence of metals background (metals only) and human health PRG

15. Boxed values denote exceedence of metals background (metals only) and ecological PRG.

16. Not available, not calculated, or not analyzed.

Table 2 - Incremental Sample Results Compared with Risk Assessment COPC Exposure Point Concentrations
Willamette Cove Upland Facility
Portland, Oregon

	EAST PARCEL	East Parcel EPC from HHRA or ERA	CENTRAL EAST PARCEL			CENTRAL WEST PARCEL	Central Parcel EPC from HHRA or ERA	WEST PARCEL	West Parcel EPC from HHRA or ERA
	2014 Incremental Samples								
PRIMARY SAMPLE	DU-4	Table 3-6 (HHRA) and Tables 4-4, 4-8	DU-5	DU-5 (lab dupe)	DU-5R	DU-6	Table 3-5 (HHRA) and Tables 4-3, 4-8	DU-7	Table 3-4 (HH RA) and Table 4-8 (ERA)
Date Sampled	1/13/2014		1/13/2014	1/13/2014	1/13/2014	1/13/2014		1/13/2014	
Sample Interval (inches)	0-6		0-6	0-6	0-6	0-6		0-6	
Metals (EPA 6000/7000 Series Methods; mg/kg)									
Antimony	2.89	71	1.29	1.31	1.48	<0.510	7.4	<0.519	--
Arsenic	3.67	13	6.02	8.03	7.41	4.95	12	4.52	--
Copper	65.1	10,600	293	271	196	404	1,400	102	--
Lead	201	780	310	304	271	164	632	43.0	95
Zinc	221	630	238	250	197	187	565	151	--
Mercury	0.0541	0.222	7.00	7.86	6.58	11.00	3.84	0.359	3.5
PAHs (EPA 8270 SIM; ug/kg)									
Benzo(a)anthracene	93.8	--	162	163	152	400	4,010	187	--
Benzo(a)pyrene	219	350	288	294	253	660	7,820	313	540
Benzo(b)fluoranthene	195	430	361	326	275	648	5,880	265	400
Benzo(k)fluoranthene	165	--	313	324	331	521	3,910	252	--
Dibenz(a,h)anthracene	41.4	60	66.7	65.0	41.7	224	1,570	66.9	90
Indeno(1,2,3-cd)pyrene	119	--	172	168	175	623	5,140	148	390
BapEq	305	490	430	431	316	1,064	10,900	445	660
HPAHs	1,570	--	2,718	2,719	2,470	5,693	57,000	2,493	--

Notes:

1. µg/kg (ppb) = micrograms per kilogram (parts per billion)
2. mg/kg (ppm) = milligrams per kilogram (parts per million)
3. -- = Not a Contaminant of Potential Concern [COPC] for this exposure area.
4. Shading indicates that incremental sample result exceeds risk assessment exposure point concentration (EPC).
5. HHRA = Residual Human Health Risk Assessment, Willamette Cove Upland Facility. December 2013.
6. ERA = Ecological Risk Assessment, Residual Risk Assessment, Willamette Cove Upland Facility. January 2014.



Note: Base map prepared from USGS 7.5-minute quadrangles of Linnton and Portland, OR, dated 2011 as provided by USGS.gov.

0 2,000 4,000
Approximate Scale in Feet



Facility Location Map

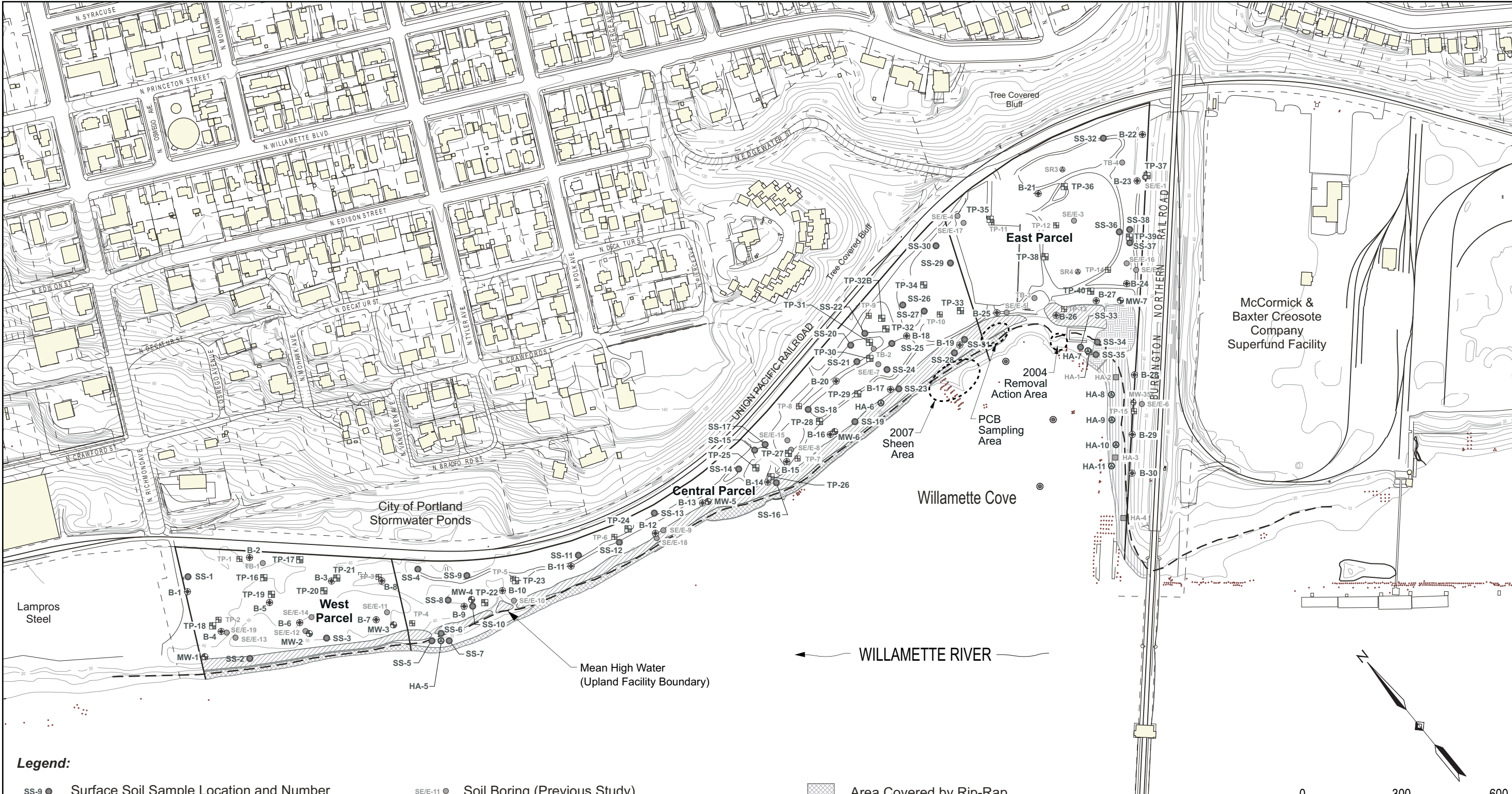
Incremental Surface Soil Sampling
Willamette Cove Upland Facility
Portland, Oregon



Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1056-03
February 2014	

Figure
1



Legend:

SS-9 ●	Surface Soil Sample Location and Number	SE/E-11 ●	Soil Boring (Previous Study)		Area Covered by Rip-Rap
B-9 ⊕	Soil Boring Location and Number	HA-2 ■	Hand Auger (Previous Study)		Area Covered by Heavy Vegetation Along River
HA-5 ⊕	Hand Auger Soil Boring Location and Number	TP-4 ▣	Test Pit (Previous Study)		Area Covered by Clean Imported Sand
TP-24 ▣	Test Pit Location and Number	SR4 ⊕	Surface Soil Sample (Previous Study)		Area of Armored Sediment Cap
MW-5 ⊕	Monitoring Well Location and Number	MW-35s ⊕	Monitoring Well Location and Number (Previous Study)		
●	Sediment Sample Location				

Note: Base map prepared from an electronic file provided by Hart Crowser.

Upland Facility Plan

Incremental Surface Soil Sampling
Willamette Cove Upland Facility
Portland, Oregon

	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	I056-03	Figure 2
		February 2014		



Legend:

- | | | | |
|---|--|-------|---|
| ● | Incremental Sample Location | //// | Historical Wharf Road Incremental Samples |
| ▨ | Grids Fully Covered by Portland-Cement Concrete Slab | - - - | Site Boundary |
| ▩ | Grids Fully Covered by Asphalt-Concrete | | |

Source: Base map prepared from a 2005 aerial photograph.

0 250 500
Scale in Feet

Sampling Plan

Incremental Surface Soil Sampling
Willamette Cove Upland Facility
Portland, Oregon



Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number

1056-03

February 2014

Figure

3

Attachment A

Laboratory Analytical Reports (CD-ROM) and Data Quality Review

1.0 INTRODUCTION

This appendix documents the results of a quality assurance/quality control (QA/QC) review of the analytical data for incremental surface soil samples collected for the Willamette Cove Upland Facility in Portland, Oregon. Samples were collected from January 7 through 13, 2014, by Apex Companies, LLC (Apex). The incremental sample processing and laboratory analyses for dioxin/furans (D/F) were performed by Vista Analytical (Vista) of El Dorado Hills, California. The laboratory analyses for metals and polycyclic aromatic hydrocarbons (PAHs) were subcontracted by Vista to Specialty Analytical in Clackamas, Oregon. Copies of the analytical laboratory reports are included in this Attachment (on CD-ROM).

Examination and validation of the laboratory summary report includes:

- Analytical methods;
- Reporting limits;
- Detection limits and estimated concentrations;
- Sample holding times;
- Custody records and sample receipt;
- Spikes, blanks, and surrogates; and
- Calibration and internal standard.

This data quality review did not include a review of raw data.

2.0 ANALYTICAL PROGRAM

The samples collected during this investigation were analyzed for the following analyses (and associated methods):

- Dioxin/Furans by EPA Method 8290;
- Priority Pollutant 13 metals by EPA 6000/7000 series methods; and
- PAHs by EPA Method 8270-SIM.

3.0 QA Objectives and Review Procedures

The general QA objectives for this project were to develop and implement procedures for obtaining, evaluating, and confirming the usability of data of a specified quality for evaluating risk to human health and the environment. To collect such information, analytical data must have an appropriate degree of accuracy and reproducibility, samples collected must be representative of actual field conditions, and samples must be collected and analyzed using unbroken chain-of-custody (COC) procedures.

Reporting limits and analytical results were compared to action levels for each parameter in the media of concern. Precision, accuracy, representativeness, completeness, and comparability parameters used to indicate data quality are defined below.

Detection Limits. The method detection limit (MDL) is the lowest quantity of a substance that can be distinguished from the absence of that substance within a stated confidence limit. The MDL is estimated from the mean of the blank, the standard deviation of the blank, and some confidence factor. Performing the sample preparation has potential to underestimate the true MDL. The MDLs were consistent with historical sampling events but varied based on the magnitude of the chemical impact. The MDLs were reviewed and are acceptable for this project.

Holding Times. Holding times are the length of time a sample can be stored after collection and prior to analysis without significantly affecting the analytical results. Holding times vary with the analyte, sample matrix, and analytical methodology used to quantify the analyte concentration. The samples were analyzed within the holding times specified for the requested analyses with the exception of mercury. The initial mercury analysis was completed within the holding time but required reanalysis (which was completed 12 days 12 days beyond holding time).

Custody Records and Sample Receipt. COC refers to the document or paper trail showing the seizure, custody, control, transfer, analysis, and disposition of physical and electronic evidence. The sample receipt identifies the condition of samples upon arrival at the analytical laboratory. Samples were received consistent with the accompanying COC.

Method Blanks. A method, or laboratory, blank is a sample prepared in the laboratory along with the actual samples and analyzed for the same parameters at the same time. It is used to assess if detected contaminants may have been the result of contamination of the samples in the laboratory. No compounds were detected in the method blanks.

Laboratory Control Sample/ Laboratory Control Sample Duplicate. A laboratory control sample (LCS) is analyzed by the laboratory to assess the accuracy of the analytical equipment. The sample is prepared from an analyte-free matrix that is then spiked with known levels of the constituents of interest (i.e., a standard). The concentrations are measured and the results compared to the known spiked levels. This

Attachment A - Data Quality Review

comparison is expressed as percent recovery. The LCS analyses completed by Vista are referred to in the laboratory reports as the On-Going Precision and Recovery (OPR) Standard. The laboratory project manager verified that the OPR is equivalent to the LCS.

In addition, a second LCS (i.e., the laboratory control sample duplicate [LCSD]) is prepared as above and analyzed. Analytical precision is quantitatively expressed as the relative percent difference (RPD) between the LCS and LCSD. The LCS/LCSD results were within acceptable ranges. There was no LCSD analyzed for metals.

Matrix Spike Analyses. Matrix spike (MS) analyses are performed on samples submitted to the laboratory that are of the same matrix as the actual sample. It is spiked with known levels of the constituents of interest. These analyses are used to assess the potential for matrix interference with recovery or detection of the constituents of interest and the accuracy of the determination. The spiked sample results are compared to the expected result (i.e., sample concentration plus spike amount) and reported as percent recovery.

Specialty Analytical reported that the recovery was outside the control limits for several PAHs and metals. Two additional notes were provided by the laboratory.

1. Sample concentration was greater than 4x the spiked value, the spiked value is considered insignificant.
2. Result is outside control limits due to matrix interference.

The batch was accepted based on the LCS recovery.

Laboratory Duplicate. A laboratory duplicate is a second analysis of the QA/QC sample, which serves as an internal check on laboratory quality as well as potential variability of the sample matrix. The laboratory duplicate is analyzed and compared to the primary sample analysis to assess the precision of the analytical method. This comparison can be expressed by the RPD between the original and duplicate samples. The duplicate analyses were within acceptable ranges.

Surrogate Recovery. Surrogates are organic compounds that are similar in chemical composition to the analytes of interest and spiked into environmental and batch QC samples prior to sample preparation and analysis. Surrogate recoveries for environmental samples are used to evaluate matrix interference on a sample-specific basis. Surrogates are organic compounds that are similar in chemical composition to the analytes of interest and spiked into environmental and batch QC samples prior to sample preparation and analysis. Surrogate recoveries for environmental samples are used to evaluate matrix interference on a sample-specific basis. Surrogate spike results were within acceptable ranges.

Attachment A - Data Quality Review

The surrogate recovery analyses for the dioxins/furans (completed by Vista) are referred to in the laboratory reports as the Internal Standard (IS). The laboratory project manager verified that the IS recovery percentages are equivalent to the surrogate recovery percentages. The IS results were within acceptable ranges.

Calibration. Satisfactory instrument calibration is established to confirm that an instrument is capable of producing acceptable quantitative data. An initial calibration verification (ICV) demonstrates that the instrument is capable of acceptable performance at the beginning of an experimental sequence. Continuing calibration verifies (CCV) that the daily performance of the instrument is satisfactory. The ICVs and CCVs met the method acceptance criteria.

Internal Standard. An internal standard is a chemical substance that is added in a constant amount to samples, the blank, and calibration standards in a chemical analysis. This substance is then used for calibration by plotting the ratio of the analyte signal to the internal standard signal as a function of the analyte concentration of the standards. This is done to correct loss of analyte during sample preparation. The internal standards met the method acceptance criteria.

4.0 QA/QC Review Conclusion

Individual D/F analytes in each sample were assigned with an “E” qualifier, indicating that the analyte was detected at a concentration that exceeded the calibration limit. Consequently, the reported concentration is an estimate and represents a value that may be biased high. Also, at least one dioxin group in each sample was reported as the maximum possible concentration due to possible chlorinated diphenylether interference during analysis that could interfere with the analysis of furans. The reported value for the analyte or analyte group is an estimate that is biased high.

In conclusion, the overall QA objectives have been met, and the data (as qualified) are of adequate quality for use in this project.

5.0 Qualifiers

Below is a list of all qualifiers used on the tabulated results of the laboratory analyses.

- E = Above the high calibration limit.
- P = The amount reported is the maximum possible concentration due to possible chlorinated diphenylether interference.
- HT = Sample was analyzed outside recommended holding time (at client request).